



The spectrum of respiratory pathogens among returning Hajj pilgrims: myths and reality



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SUMMARY

Enhanced surveillance systems have been implemented recently in many countries in order to rapidly detect and investigate any possible cases of Middle East respiratory syndrome coronavirus (MERS-CoV) infection among travellers returning from the Middle East, including notably Hajj pilgrims. According to the available surveillance data, only a few sporadic travel-associated MERS-CoV cases have been reported outside the Arabian Peninsula so far, mainly in Europe, North Africa, and Asia. These have resulted in no cases, or limited numbers of secondary cases except in Korea. The vast majority of viral respiratory infections in pilgrims returning home have been due to seasonal influenza viruses, rhinoviruses, and other known coronaviruses distinct from the MERS coronavirus. Influenza vaccination should be a priority for all Hajj pilgrims, as recommended by experts.

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The emergence of severe acute respiratory syndrome coronavirus (SARS-CoV) in 2003 in China,¹ the H1N1 influenza pandemic in 2009,² and the emergence of Middle East respiratory syndrome coronavirus (MERS-CoV) in the Kingdom of Saudi Arabia (KSA) in 2012³ has aroused widespread fear and concern for their potential threat to global health security.^{4,5} Elaborate surveillance and infection control measures were put in place during the 2009 Hajj. In the event, it was found that there were more cases of seasonal influenza reported than of H1N1.⁶

One thousand six hundred and twenty-four laboratory-confirmed cases of MERS-CoV, including 586 related deaths, had been reported to the World Health Organization as of January 23, 2016 (<http://www.who.int/emergencies/mers-cov/en/>). Millions of Muslims, from over 180 countries worldwide, make the annual pilgrimage to Mecca, Saudi Arabia. Due to the overcrowded conditions, there is the potential for increased person-to-person

spread of infectious diseases and a favourable transmission of respiratory tract infections.⁶ The occurrence of such events spreads fear of a massive outbreak among pilgrims that could spread to their countries of origin.⁷

This situation has prompted health authorities to establish enhanced surveillance systems in many countries in order to rapidly detect and investigate any possible cases of MERS-CoV infection among travellers returning from the Middle East. Fortunately, only a few sporadic travel-associated MERS-CoV cases have been reported outside the Arabian Peninsula, mainly in Europe, North Africa, and Asia.^{8,9} These have resulted in no cases, or some secondary cases, with the notable exception of the Republic of Korea. In the Republic of Korea, 185 cases were epidemiologically linked to a single index case who had visited several countries in the Middle East.¹⁰

A large-scale surveillance study has provided interesting insights into the epidemiology of respiratory tract infections in travellers returning from the Middle East, including Hajj and Umrah pilgrims. During September 2012 to October 2013, 77 travellers from the Middle East who met the possible case

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definition for MERS were tested in England and two of them tested positive for MERS-CoV.¹¹ Also, 22 had positive results for alternative respiratory pathogens, including 10 (13%) cases of influenza A or B and four (5%) cases of rhinovirus.⁹ UK surveillance data focusing on the period of return of Hajj pilgrims during the years 2013–2015 (September–October) evidenced influenza infection in 46% and rhinovirus in 30% of 50 patients suspected of MERS (<https://www.gov.uk/government/publications/health-protection-report-volume-9-2015/hpr-volume-9-issue-36-news-9-october>). Of the first 14 patients returning from the Middle East who were hospitalized for respiratory symptoms and screened for MERS-CoV in Marseille, France in October 2013, nine (64%) were infected with influenza and all samples tested negative for MERS-CoV.¹² In another small survey conducted in 2014 in Austria and investigating seven Hajj pilgrims suspected of MERS, none had MERS-CoV, five had influenza, and two were infected by rhinovirus.¹³ A survey conducted among 177 travellers from the Middle East suspected of MERS on returning to Ontario, Canada in 2012–2014, showed that none tested positive for MERS-CoV, 41 (23%) were positive for influenza, and 35 (20%) for rhinovirus.¹⁴ Finally, in a survey conducted in 2013–2014 in California, USA among 52 patients suspected of MERS, none was positive for MERS, 17 (33%) were positive for influenza, and seven (13%) for rhinovirus.¹⁵ Other pathogens were isolated in smaller proportions, including parainfluenza viruses, human metapneumovirus, respiratory syncytial virus, enterovirus, adenovirus, non-MERS coronaviruses, *Chlamydia pneumoniae*, and *Legionella* spp.^{11–15}

Besides surveillance implemented in returned travellers suspected of MERS, several teams in Egypt, Iran, Saudi Arabia, France, and Ghana have conducted systematic PCR-based screening surveys among cohorts of returning Hajj pilgrims independently of their clinical status. MERS-CoV carriage was investigated in four studies and was not detected.^{12,16–18} Influenza carriage was investigated in six studies and its mean prevalence was 3% (range 1–8%);^{18–23} rhinovirus carriage was investigated in four studies and its mean prevalence was 13% (range 8–17%).^{18,21–23} Carriage of non-MERS coronavirus was investigated in two studies and the prevalence was found to be 1% and 21%, respectively.^{21,23} Finally, the carriage of *Streptococcus pneumoniae* was investigated in two studies, which reported prevalences of 20% (nasal carriage) and 62% (throat carriage).^{22,23} Other viruses were isolated in smaller proportions, including parainfluenza viruses, human metapneumovirus, respiratory syncytial virus, enterovirus, and adenovirus.^{18,21–23} Finally, two PCR-based studies were conducted among returning Iranian pilgrims suffering from upper respiratory tract infections and reported a prevalence of influenza of 10% and 12%, respectively.^{24,25}

Taken together, these results strongly suggest that Mecca may act as a global hub for respiratory pathogens through the Muslim pilgrimage and contribute to their globalization.²⁶

Obviously, the vast majority of viral respiratory infections in Hajj and Umrah pilgrims returning home are due to seasonal influenza viruses, rhinoviruses, and other known coronaviruses distinct from the MERS coronavirus. Bacteria like *S. pneumoniae* may also play a role, as well as *Haemophilus influenzae* and *Klebsiella pneumoniae*, for which a high rate of acquisition following participation in the Hajj has been observed in pilgrims before leaving Saudi Arabia.²⁶ Tuberculosis has also been reported among patients admitted to hospital during the Hajj;⁶ however, given the incubation time of the disease, it is challenging to identify such cases.

Clinicians should be aware that influenza is the most commonly identified pathogen in returning pilgrims with an acute respiratory tract infection. However, a microbial cause is not identified in a significant proportion of patients with a respiratory infection,

which makes the overall incidence of influenza very low. Empirical antiviral treatment for influenza on admission when indicated may be considered pending the results of laboratory investigations, although oseltamivir resistance among influenza strains has been reported. Influenza vaccination should be a priority for all Hajj pilgrims, as recommended by experts.^{27,28} However, since Hajj dates are now moving to the summer season, the lack of availability of the influenza vaccine in many countries during this period will hamper this strategy. Public health measures introduced by Saudi Arabia in 2015, banning the sacrifice of camels for Hajj and discouraging visits by pilgrims to camel barns during Hajj pilgrimage activities, are sensible precautionary measures that should be considered as part of pre-travel advice in the home countries of pilgrims.

Despite the paucity of actual cases of MERS in travellers returning from the Middle East and the virtual absence of Hajj-associated cases in this context, continuous surveillance should be implemented to ensure the timely detection of possible imported cases of MERS and their immediate isolation in order to avoid secondary cases. The recent experience in South Korea, with a single chain of transmission associated with healthcare facilities resulting in many cases, is a reminder that enhanced surveillance at ports of entry is critical. The few pilgrimage-associated cases of MERS in travellers reported so far were in Umrah pilgrims.⁷ An estimated eight million pilgrims perform the Umrah yearly.²⁹ The number of Umrah pilgrims is particularly high during the month of Ramadan, and that period could be considered the second mass gathering in Saudi Arabia, although of a lesser size compared to the Hajj. Studies on respiratory tract infections during Ramadan are scarce; thus continued surveillance of respiratory infections and of the spectrum of associated pathogens among pilgrims returning from the Umrah during Ramadan and from the subsequent Hajj is of critical importance.

Conflict of interest: No conflict of interest to declare.

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